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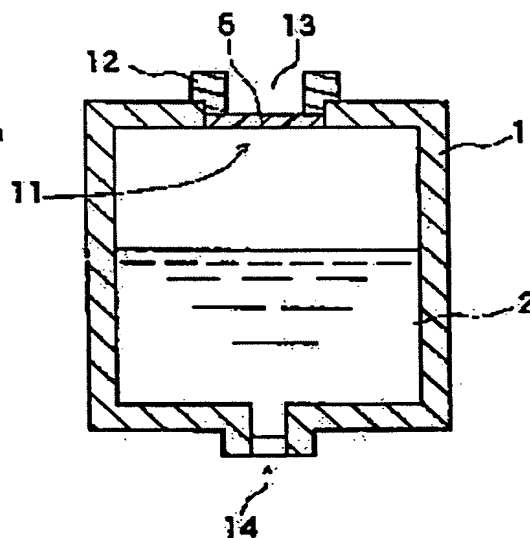
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(54) AIR FILTER FOR INK VESSEL AND INK VESSEL USING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an air filter and an ink vessel having the same wherein ink hardly leaks therefrom even when change of a temperature occurs in a condition that the air filter is contacted with the ink and thermal expansion of the air in a case or evaporation of the ink occurs and then the ink is pressed against the air filter.

SOLUTION: The air filter 5 wherein at least one layer of a porous body made from a fluororesin such as polytetrafluoro-ethylene or a polyolefin resin and at least one layer of an air-permeable support material of which the tensile stress is not less than 1 MPa are laminated is attached to an air hole of the ink vessel.



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CLAIMS

[Claim(s)]

[Claim 1] The aeration filter for ink containers characterized by being the layered product which contains further at least the porous body which consists at least of one side chosen from a fluororesin and polyolefin resin, and the permeability supporting material whose tensile strength is 1 or more MPas, respectively.

[Claim 2] The aeration filter for ink containers according to claim 1 the permeability of permeability supporting material displays with the number of gar rhes, and is [filter] 300 seconds / 100ml or less.

[Claim 3] the aeration filter for ink containers according to claim 1 or 2 with which a layered product is further alike at least, and water-repellent oil-repellent processing is performed.

[Claim 4] The aeration filter for ink containers according to claim 1 to 3 with which a porous body consists of polytetrafluoroethylene, and permeability supporting material consists of ultra high molecular weight polyethylene.

[Claim 5] The ink container characterized by having the space in which ink is held, and at least one air hole in which the aeration filter according to claim 1 to 4 was prepared.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the aeration filter for ink containers, and the ink container which used this, and relates to the ink container equipped with the air hole which flows through the building envelope and outer space for containing and keeping ink in more detail, and the aeration filter prepared in this air hole.

[0002]

[Description of the Prior Art] From the former, the device which supplies ink to a print head from an ink cartridge is used abundantly with image formation equipments, such as a printer. By this device, the ink cartridge which held ink in the container beforehand is carried in predetermined locations, such as a printer. In this condition, ink is supplied to a print head from an ink cartridge. The ink reservoir container which holds ink temporarily between an ink cartridge and a print head may be prepared. Generally as a dispersion medium of an ink component, the mixed solvent of water or water, and the organic solvent (for example, lower alcohol, such as a methanol, ethanol,

isopropyl alcohol, and n-propanol) that has good compatibility is used.

[0003] However, if the oil level of ink descends as ink decreases in number, negative pressure will arise for the interior of an ink cartridge, or the path of ink. If this negative pressure becomes large, the normal regurgitation of ink will be barred and a blur will arise in printing. Then, the air hole is prepared in the path of an ink cartridge or ink. An air hole is prepared in the location which is not flooded with ink in the state of the anticipated use which carried the ink cartridge in the printer. However, when a printer and an ink cartridge are leaned at the time of transport and storage, an air hole is flooded with ink and there is a possibility that ink may be revealed from an air hole. For this reason, although an air hole is made to pass air, it is proposed by it that a liquid attaches the aeration filter which is not passed, for example, a polytetrafluoroethylene (henceforth "PTFE") porous body etc.

[0004] Furthermore, recently, in order to gather the printing speed of a printer, pressurizing the inside of an ink cartridge and an ink path, and accelerating the regurgitation of ink has come to be performed. Moreover, since there is a possibility that the ink of an ink cartridge or an ink path may leak from a print head when the ambient temperature of the printer circumference rises, making an ink cartridge and an ink path into negative pressure at the time of printing termination, and sucking up ink has come to be performed.

[0005]

[Problem(s) to be Solved by the Invention] Thus, the engine performance which it is also stabilized in an aeration filter for a certain reason that positive pressure or negative pressure is applied through an air hole, and prevents ink leakage is called for. Then, this invention aims at offering the aeration filter for ink containers which has the high ink leakage control engine performance. Moreover, another object of this invention is to offer the ink container which used this aeration filter.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned object, the aeration filter for ink containers of this invention is characterized by being the layered product which contains further at least the porous body which consists at least of one side chosen from a fluororesin and polyolefin resin, and the permeability supporting material whose tensile strength is 1 or more MPas, respectively. In addition, with this description, it is JIS about tensile strength. K It shall set according to 7127. However, a test period is considered as a part for 200mm/.

[0007] With the aeration filter for ink containers of this invention, a porous body is reinforced by permeability supporting material, and since the tensile strength of

permeability supporting material is 1 or more MPas further, it has the high ink leakage control engine performance. Since tensile strength is especially reinforced by high permeability supporting material, deformation by application of pressure or reduced pressure can be controlled effectively. Moreover, since the ingredient which can perform accurate porosity-ization easily is used for the porous body, it can consider as an aeration filter with high aeration stability. Especially the upper limit of the tensile strength of permeability supporting material is not limited. However, from a viewpoint of the workability in the case of joining a porous body and permeability supporting material by joining etc., 1MPa-1500MPa is suitable for tensile strength, and it is 3MPa-500MPa more preferably.

[0008] With the aeration filter of this invention, the permeability of permeability supporting material displays with the number of gar rhes, and it is desirable that they are 300 seconds / 100ml or less. It is because the pressure differential of ink container inside and outside is promptly cancelable. In addition, on these descriptions, it shall set by the gar rhe examining method by which the number of gar rhes is specified JIS P8117. Especially the minimum of the number of gar rhes is not limited. However, from a viewpoint of reinforcing a porous body, 0.1 seconds / 100ml - 300 seconds / 100ml are suitable for the number of gar rhes, and they are 0.5 seconds / 100ml - 100 seconds / 100ml more preferably.

[0009] moreover, it is desirable that a layered product is further alike at least, and water-repellent oil-repellent processing is performed with the aeration filter of this invention. It is because osmosis of the ink to a filter is controlled and leakage of ink can be controlled still more effectively. Moreover, it is desirable that a porous body consists of PTFE and permeability supporting material consists of ultra high molecular weight polyethylene with the aeration filter of this invention.

[0010] The ink container of this invention is characterized by having the space in which ink is held, and at least one air hole in which the aeration filter of the above-mentioned publication was prepared. The ink container of this invention becomes that whose ink leakage control engine performance improved.

[0011]

[Embodiment of the Invention] Hereafter, the desirable operation gestalt of this invention is explained, referring to a drawing. Drawing 1 is the sectional view showing one gestalt of the ink container (ink cartridge) which used the aeration filter of this invention. The interior of the case 1 of this ink cartridge is used as space for holding ink 2. Ink 2 is poured in inside a case from the ink injected hole 11. Cap 12 is inserted in the ink injected hole 11 after pouring in ink 2. Ink 2 is sent into drawing equipments,

such as a printer head, from the ink discharge opening 14, where a printer head etc. is equipped with an ink cartridge.

[0012] The air hole 13 is formed in the interior of cap 12, and the building envelope and outer space (atmospheric air) of a case 1 have flowed through this air hole 13. The aeration filter 5 is attached in the air hole 13. The aeration filter 5 is compound-ized by the cap 12 attached so that the ink injected hole 11 might be closed. The aeration filter 5 should just fix on the cap 12 beforehand by heating joining, ultrasonic welding, oscillating joining, adhesion, etc.

[0013] In addition, two or more air holes 13 equipped with the aeration filter 5 may be formed in a case. In this case, it is desirable to arrange two or more air holes so that at least one air hole may not be buried in the ink in which only the amount of conventions was introduced irrespective of the position of an ink cartridge.

[0014] The layered product of the porous body and permeability supporting material which consist of PTFE or polyolefin resin can be used for the aeration filter 5. There is especially no limit in the sequence of the number of laminatings, and a laminating etc. that much more porous body and permeability supporting material should just be contained in this layered product at least. In addition, it is better for the side which faces the building envelope (ink hold space) of an ink container to be the above-mentioned porous body, in order to make the permeability of ink low. Therefore, as for an aeration filter, it is desirable that the above-mentioned porous body is exposed from one [at least] field.

[0015] Drawing 2 is the sectional view showing one another gestalt of the ink container (ink cartridge) of this invention. In this ink cartridge, it has fixed in the direct case 2 so that the aeration filter 5 may cover the ink injected hole 11. In addition, with any gestalt of drawing 1 and drawing 2, decompressing through an aeration filter, instead of pouring in from an ink injected hole, ink may be sucked up from the ink discharge opening 14, and you may introduce inside a case.

[0016] Drawing 3 is the sectional view showing one gestalt of the ink reservoir container which is an ink container of this invention. This ink reservoir container is pressurized from the outside through the aeration filter 5, and has the structure of breathing out ink compulsorily from a discharge opening 14, or decompressing conversely and attracting ink from the attraction hole 15. But this invention is applicable not only to the gestalt shown in drawing 1 - drawing 3 but a general ink container.

[0017] Hereafter, a porous body and permeability supporting material are explained. As a porous body, fluororesin porous membrane and polyolefine porous membrane can

be used. As a fluoro-resin, a PTFE, polychlorotrifluoroethylene resin, and tetrafluoroethylene-hexafluoropropylene copolymer, a tetrafluoroethylene-perfluoroalkyl vinyl ether copolymer, a tetrafluoroethylene-ethylene copolymer, etc. are mentioned. As polyolefine, polyethylene, polypropylene, poly4 methyl 1 pentene, poly1 butene, etc. are mentioned. Since especially PTFE porous membrane is excellent in permeability, ink-proof nature, and water-repellent oil repellency, it can prevent lowering of the permeability by blinding, or can prevent ink leakage for a long time.

[0018] An example of an approach which manufactures PTFE porous membrane is explained below. First, the paste-like admixture which added the fluid lubrication agent to PTFE fine powder is preformed. A fluid lubrication agent can wet the front face of PTFE fine powder, especially if removable [with an extract or desiccation], it will not be restricted, for example, it can use hydrocarbons, such as a liquid paraffin, naphtha, and White oil. 5 - 50 weight section extent is suitable for the addition of a fluid lubrication agent to the PTFE fine powder 100 weight section. The above-mentioned preforming is performed by the pressure which is extent by which a fluid lubrication agent is not pressed out. Next, a preforming object is fabricated in the shape of a sheet with paste extrusion or rolling, this PTFE Plastic solid is extended to at least 1 shaft orientations, and PTFE porous membrane is obtained. In addition, as for the drawing of a PTFE Plastic solid, it is desirable to carry out, after removing a fluid lubrication agent. This porous body may be heated and calcinated at the temperature more than the melting point of PTFE.

[0019] If too large, membranous reinforcement will fall, or ink leakage becomes easy to generate the aperture of porous membrane by the pressure buildup inside an ink container. For this reason, 0.01-5 micrometers 10 micrometers or less are usually suitable for especially the average aperture of porous membrane.

[0020] Similarly, if too thin, the reinforcement of a porous body will fall, or ink leakage becomes easy to generate the thickness of porous membrane by the pressure buildup inside an ink container. For this reason, 10-1000 micrometers 2 micrometers or more are usually suitable for especially the thickness of porous membrane.

[0021] Permeability supporting material sets tensile strength to 1 or more MPas in consideration of the endurance over the stress at the time of pressurizing or decompressing especially in an aeration filter, although construction material, structure, and a gestalt are not limited. Moreover, 300 seconds /. 100ml or less of permeability are desirable at the number of gar rhes. Moreover, as for the permeability supporting material from a viewpoint of the joining nature to an ink container or the

components for wearing, consisting of thermoplastics is desirable, and 250 degrees C or less are suitable for the melting point.

[0022] Specifically as a permeability supporting material, a polyolefine porous body, a nonwoven fabric, textile fabrics, a network, a mesh, sponge, foam, a metal porous body, a metal mesh, and other various porous body ingredients can be used. Especially an ultra-high-molecular-weight-polyethylene porous body is desirable from viewpoints, such as reinforcement, elasticity, permeability, workability, and joining nature. The average molecular weight according [this ultra high molecular weight polyethylene] to a viscosity method is the thing of 500,000–10 million preferably 300,000 or more.

[0023] It may also be good to merely pile up, it may join by joining, such as heating joining, ultrasonic welding, and oscillating joining, and may join compound-ization with a porous body and permeability supporting material using adhesives (a pressure sensitive adhesive, hot melt adhesive, thermosetting adhesive, etc.). In the case of the approach (heat lamination) accompanied by heating, the approach of making carry out melting of some permeability supporting material, and welding it, powder, the approach of making an interface intervene, heating hot melt adhesive, such as the shape of granular or a mesh, and joining, etc. are employable.

[0024] As mentioned above, especially the sequence of the laminating of a porous body and permeability supporting material may not be restricted, but may carry out the laminating of a porous body and the permeability supporting material by turns, may contain the layer which piled up the porous body continuously, and may use the porous body containing resin of a different kind. The example of the composite construction of an aeration filter is shown in drawing 4 and drawing 5.

[0025] The aeration filter 5 shown in drawing 4 is the compounded complex every much more about a porous body 6 and the permeability supporting material 7. As for this aeration filter, it is desirable to arrange so that a porous body 6 may face the space in which ink is held. The aeration filter 5 shown in drawing 5 is the complex which pinched much more permeability supporting material 7 by the porous body 6 of a bilayer.

[0026] According to the engine performance of a porous body, or the property of ink, water-repellent oil-repellent processing may be performed to an aeration filter. Although giving the porous body of an aeration filter is desirable as for water-repellent oil-repellent processing, it can also be performed to permeability supporting material, and may be performed to the whole aeration filter.

[0027] As a water-repellent oil-repellent processing agent, various kinds of fluorine-containing polymers can specifically be used. The macromolecule which has a

fluorine-containing chain forms the coat of low surface energy on the surface of fiber, and demonstrates the water-repellent oil-repellent effectiveness. As a fluorine-containing polymer, the macromolecule which has a perfluoroalkyl radical is desirable. As a polymer which has a perfluoroalkyl radical, the water-repellent oil-repellent processing agent of marketing, such as Fluorad (Sumitomo 3M make), a Scotch whisky guard (Sumitomo 3M make), a tex guard (Daikin Industries make), a uni-dyne (Daikin Industries make), and the Asahi guard (Asahi Glass make), can be used. What is necessary is for the impregnation to a water-repellent oil-repellent processing agent, spreading of this processing agent, a spray, etc. just to perform water-repellent oil-repellent processing. As for the coverage of a water-repellent oil-repellent processing agent, it is desirable to adjust so that sufficient water-repellent oil repellency may be obtained and the permeability of an aeration filter may not be barred.

[0028]

[Example] Hereafter, this invention is not restricted by the following examples although an example explains this invention to a detail further.

(Example 1) The aeration filter with the same configuration as lamination and drawing 4 for a PTFE porous body (thickness: 85 micrometers, 80% of porosity, average aperture: 1 micrometer, number of gas rhes: 3 seconds /, 100ml) and SHINTEKKUSU PS-120 (the Mitsui Chemicals make, thickness: 0.6mm, tensile strength: 6MPa, number of gas rhes: 1 second /, 100ml) which are a polypropylene nonwoven fabric was produced by heat lamination.

[0029] In order to obtain the ink container which, on the other hand, attached the aeration filter produced above and which is shown in drawing 6, it was filled up with the commercial ink 9 for printers (surface tension 33 dyne/cm) three times 30cm in the cylinder-like case 8 made from plastics with a diameter [of 2cm], and a height of 20cm. Moreover, the cap 22 made from polypropylene which the hole with a diameter of 5mm penetrated as an air hole 23 was prepared. Moreover, the lid 10 was beforehand attached in the ink delivery 24 with a bore of about 1mm. And heating welding was carried out and the above-mentioned aeration filter 5 which consists of a PTFE porous body and a nonwoven fabric made from polypropylene was united with the cap 22 so that an air hole 23 might be covered. The aeration filter has been arranged so that a PTFE porous body may become an ink side (interior side of a case) and a nonwoven fabric may become an atmospheric-air side.

[0030] (Example 2) uni— dyne TG-725 (Daikin Industries make) was diluted with toluene, and the water-repellent oil-repellent processing agent of 5 % of the weight of

solid content was produced. This processing agent was applied to the PTFE porous body (thickness: 85 micrometers, 75% of porosity, average aperture:0.2micrometer, number of gar rhes:21 seconds /, 100ml), and the PTFE porous body which heated for 3 minutes at 130 degrees C, and performed water-repellent oil-repellent processing was obtained. With this PTFE porous body that carried out water-repellent oil-repellent processing, as a permeability supporting material, the ultra-high-molecular-weight-polyethylene porous body (average molecular weight by the viscosity method: 4,400,000, thickness:0.5mm, tensile strength:12MPa, number of gar rhes:1.5 seconds /, 100ml) was prepared, the aeration filter was produced like the example 1, and the ink container was obtained still like the example 1.

[0031] (Example 3) If it replaced with the PTFE porous body and the point using a polypropylene porous body (thickness: 10 micrometers, porosity:50%, average aperture:0.04micrometer, number of gar rhes:200 seconds /, 100ml) was removed, the aeration filter was produced like the example 2 and the ink container was obtained further.

[0032] (Example 1 of a comparison) If the point using TAPIRUSU P030UA-00X (the TONEN TAPYRUS make, thickness: 0.5mm, tensile strength:0.6MPa, number of gar rhes:1 second /, 100ml) which is a polyurethane nonwoven fabric was removed as a permeability supporting material, the aeration filter was produced like the example 1 and the ink container was obtained further.

[0033] (Example 2 of a comparison) If the point using the polypropylene porous body (thickness: 0.03mm, tensile strength:0.9MPa, number of gar rhes:400 seconds /, 100ml) as a permeability supporting material was removed, the aeration filter was produced like the example 1 and the ink container was obtained further.

[0034] The following trial was performed using the ink container obtained by an above-mentioned example and the above-mentioned example of a comparison. First, as an ink leakage test, it supplied to the testing machine rotated in 1 revolution 1 second, and a blot of ink and leakage were visually observed [the testing machine] for the filter to a stop and 500,000 revolutions for every count of predetermined so that ink might contact an aeration filter, as shown in drawing 7 . The case where O, and a blot of ink and leakage were observed in the case where neither a blot of ink nor leakage is observed was made into x.

[0035] Moreover, when a container is maintained at the position of an abbreviation straight as an ink regurgitation trial as shown in drawing 6 , a lid 10 was removed and a delivery 24 was opened, it observed by viewing whether ink would be breathed out within 10 seconds. The case where it was breathed out was made as O and the case

where it was not breathed out was made into x.

[0036] The result of a trial of an ink leakage test and an ink regurgitation trial is shown in a table 1.

[0037]

(A table 1)

	An ink leakage test	An ink regurgitation trial
100,000 times	500,000 times	
An example 1	O x	
An example 2	O O O	An example 3
	O O O	
Example 1 of a comparison	x - O	Example 2 of a comparison
		x - x

[0038]

[Effect of the Invention] As explained above, according to this invention, the ink container which can prevent effectively leakage of the ink at the time of transport and storage is offered by using the aeration filter which carried out the laminating of the porous body which consists of either [at least] PTFE or polyolefin resin, and the permeability supporting material whose tensile strength is 1 or more MPas further at least, respectively.

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of one gestalt of the ink container of this invention.

[Drawing 2] It is the sectional view of one another gestalt of the ink container of this invention.

[Drawing 3] It is the sectional view of one gestalt of the ink container of this invention another again.

[Drawing 4] It is the sectional view of one gestalt of the aeration filter of this invention.

[Drawing 5] It is the sectional view of one another gestalt of the aeration filter of this invention.

[Drawing 6] It is the sectional view of the ink container produced in the example.

[Drawing 7] It is drawing for explaining a revolution of the ink container in the trial performed in the example.

[Description of Notations]

1 Eight Case

2 Nine Ink

5 Aeration Filter

6 Porous Body

7 Permeability Supporting Material

10 Lid

- 11 Ink Feed Hopper
- 12 22 Cap
- 13 23 Air hole
- 14 24 Ink delivery
- 15 Ink Attraction Hole

DRAWINGS

[Drawing 3]

[Drawing 4]

[Drawing 5]

[Drawing 6]

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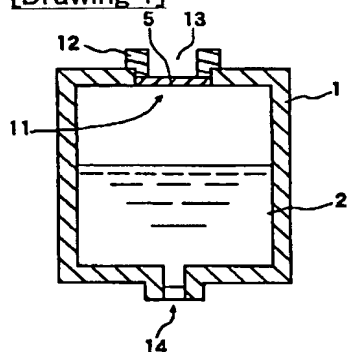
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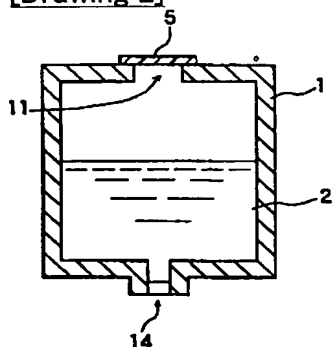
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DRAWINGS

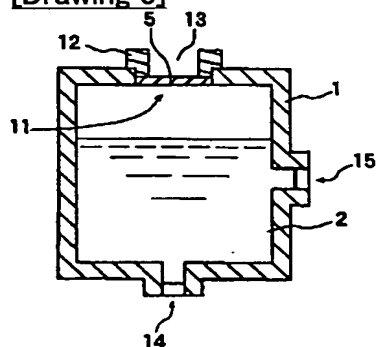
[Drawing 1]



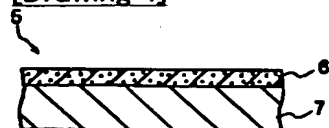
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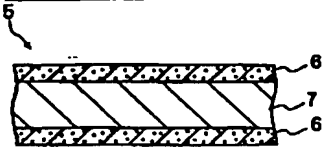
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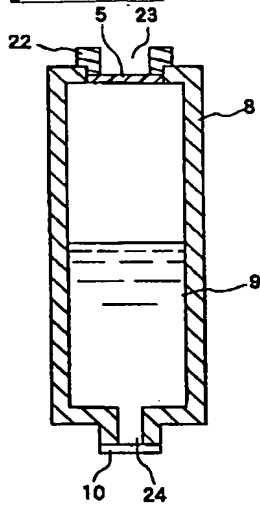
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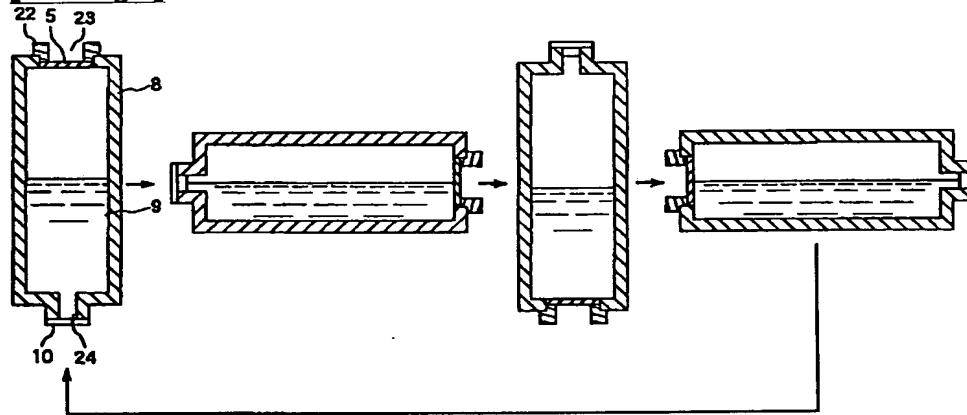
[Drawing 5]



[Drawing 6]



[Drawing 7]



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